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Insights Gained While Teaching First Semester Chemistry in the Time of COVID-19 at Bond University in Australia

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INTRODUCTION

Bond University is a small private, not-for-profit university on the Gold Coast in Australia and the university prides itself on giving a personalized and transformational student experience. At Bond University, due to the COVID-19 pandemic, we transitioned from the normal face-to-face delivery to a remote online delivery mode in week 10 of our 12-week first trimester.[1] Our cohort sizes for the first-trimester chemistry subject normally sits around 60 students on average, so our transition represent a small private online course (spocs) perspective compared to the massive open online course (moccs) which has the high failure rates and associated issues.[2, 3] The trimester continued as usual, and there were no breaks when this transition occurred. The trimester was cut to an 11-week trimester from the original 12 weeks, and the remaining assessment items were moved to the remote online learning platform, Blackboard Collaborate Ultra, from week 10 onwards. The remaining assessment items were re-weighted to align with the new online assessment items so that no one item was worth more than 50% of the final grade. This decision was made at a university level and implemented across the univerity. After the completion of the first trimester the break between the trimesters were extended by a 3-week period with the second trimester starting two weeks later than the originally planned timetable. In this extended break period, there was training and resources for staff provided by the office of teaching and learning to help staff deliver the second trimester entirely remotely and online. In this reflection, we will separate the discussion of the first trimester and second-trimester teaching experiences with this small cohort of students. The advantage we have had was the quick time scale in the first trimester and extended trimester break before the second trimester started which

allowed academics to reflect and consolidate the information gathered to help give the best student experience possible.

FIRST TRIMESTER REFLECTION

In the last two weeks of the first trimester, there was a sudden change to remote online learning within a short timeframe. These final weeks consisted of teaching new content and a few remaining assessment items for one of the main chemistry subjects. The 'normal' delivery of this subject, pre-remote learning, consisted of three separate sessions spaced out over the week starting with a 2 hour lecture, followed by a 2 hour group learning than a 1 hour tutorial session and then laboratories fortnightly. The group learning session is a session where students work through practice problems in small groups and the academic moderates and answer any questions the student may have. The students can check their answers as they work through them with the worked solutions that are made available online. The tutorial session is where an academic will go through the specific set of tutorial questions and answers with a small group of 12 (maximum) students. The delivery method used for the last two weeks, due to the rush moving to the online platform, was a flipped classroom.[4, 5] The flipped learning delivery is a pedagogical approach in which the pre-recorded lecture (a voice-over PowerPoint) is released to the students prior to the class time. This approach has many benefits such as allowing students to learn at their own pace, promoting active learning in the class time, cultivating independent thinking in individuals and improving engagement and student outcomes.[6] We were then able to use the 2 hour group learning time as a 2 hour online workshop where we worked through practice examples as a large group of 60 students, and we were able to identify issues and clarify any part of the content that the students needed further help with. This virtual classroom was delivered using an online collaborative platform (Blackboard Collaborative Ultra) and was structured to facilitate students in developing a deeper understanding of the content through problem-solving and peer discussions.[7] The platform allows the moderator or academic to deliver live PowerPoint presentations with the ability to write on top of the slides as needed. We found that it worked well for us to have the live chat feature active, with the student's video and microphones

turned off. This allowed the students to ask questions and have a personalized experience without using too much bandwidth or feeling their privacy was invaded. The platform also has other features such as integrated poling, breakout rooms (for splitting the larger class into smaller groups), response feeling emojis, and shared whiteboards which make the platform very versatile and personal.

• STUDENT ENGAGEMENT

While we were all learning this new technology, the initial layout of a pre-recorded lecture and interactive tutorials and group learning allowed students to have as much constructive time as possible with the academic. The student engagement was very good for the two weeks as we had an established relationship with the students (from 10 weeks of face-to-face teaching) and they enjoyed using the new technology. At this point in the trimester, the laboratory classes had been delivered, with the remaining assessments being the final examinations and laboratory reports.

• ASSESSMENT ITEMS

The examinations were re-weighted and moved to an online platform. The exams were made available for a 24-hour timeframe to account for international students who chose to return home during these events. Students were reminded of the student code of conduct policy and the associated implications if they were to breach it. In reflection of the final examinations, we found that the spread of grades attained from the students was similar to the past years. Online examinations had not previously been used for this subject, and we were unsure of how the online examination would go since the exam essentially turned from a closed book 2 hour exam to an open book 2 hour exam. The exams were set up with randomized multiple-choice questions that each had a randomized multiple-choice response and no backtracking allowed. We had hoped that this setup would minimize the collaboration between students and deliver more authentic results.

The challenges that arose with the use of online examinations were, both teachers and students had not used the platform before. The academics were able to adapt and learn the

new platform quickly as the platform was relatively easy to navigate. Working through this challenge, the students were given practice online examinations leading up to the final graded examination. There was also extra time allocated for internet disruptions and a 24-hour access period for taking the examination to account for students who may have been in a different time zone. The exams were very successful, and there were no students who experienced technical issues. Exam questions were mainly application questions and consisted of minimal recall questions. We have found that the application question style works best for our cohorts as the authentic assessments strengthen the students ability to think critically and creatively. This then helps with the transition to the next subjects in their degree program that require them to solve real-life problems.[8] As mentioned, the grades were similar to the average distribution for the subject.

Overall, the technology challenges, such as the online examination and learning how to use the new online collaborative platform, were very successful. No students reported issues associated with any aspect of online learning, including hardware or software issues. The students did say that they would prefer face-to-face teaching and a paper-based examination. Still, given the extraordinary circumstances, they were happy with their overall course and grade.

SECOND TRIMESTER REFLECTION

With time between the semesters, we were able to train for online delivery. The university's office for teaching and learning produced numerous resources and ran multiple training sessions with online live collaborate sessions. The university wanted to ensure that no student was disadvantaged and that the personalized experience was not lost with the new online delivery mode.

The second trimester delivery for the same main chemistry subject was now structured more like the 'normal' delivery of the subject (pre-COVID-19) but with a cohort of 30 students compared to the 60 student cohort from the previous trimester. The delivery pattern was a 2 hour lecture, 2 hour group learning (a session where we work through practice problems as a large group of 30 students) and a 1 hour tutorial (a session where an academic will go through the specific set of tutorial questions and answers in a small group of 12 students

(maximum)). All classes were delivered through the online collaborative platform. Collaborative learning was encouraged in all the sessions, and the students were actively participating in the lectures, group learning and tutorials through the chat function. During the classes, the students were encouraged to participate with a virtual whiteboard where they solved problems together which fostered a collaborative environment.[9]

The laboratory classes for the semester needed to be changed for the new online delivery mode, and we found that the best solution for our students and academics were to film virtual laboratory classes. In chemistry, we made the laboratory class into a 360-degree interactive tour (see our recent technology report) where the pre-existing laboratory classes were embedded into a laboratory setting. The student was able to move around the room and watch the experiment progress while collecting the experimental data.[10] The collected data was then used to complete their reports or worksheets that were linked to that particular experiment. This allowed us to use all the pre-existing laboratory resources that had been developed previously and deliver them in a fun and interactive way. We chose this option as we had been working with 360-degree virtual tours in 2019, so the technology was known to us, and the resources were quick and easy to make.

- **STUDENT ENGAGEMENT**

The student engagement in the second trimester was of utmost importance to the delivery model as the enrolled students were all new to the university and had not been on campus before. Our main goal was for them to feel that they were involved with a community. Therefore, all the classes, besides the laboratory classes, were delivered live through the online collaborative learning platform. As mentioned before the platform is very versatile and allows the academic to go through the normal PowerPoint sides live and have an active chat window so that the students can ask questions as they work through the content. The lecturer and students could write on the slides and draw images which is a vital part of teaching chemistry. The use of poling and emojis were employed during the lectures to keep the classes interactive, and all classes had 'free' time allocated to them. During the 'free' time which was roughly 20 mins at the end of the lecture class and group learning class, the students were

encouraged to communicate directly with the lecturer through the chat function to try and foster the personalized experience that Bond University is known for. The 20 min time period was always sufficient to answer any questions that the students had. If any of the students wanted personal consultation time, then a one-on-one meeting was organized outside of the class time. Outside of the main subjects, the programs had organized regular virtual 'coffee' rooms that were set up for the students to catch up with each other and academics in a relaxed environment.

- **ASSESSMENT ITEMS**

The assessment items were consolidated for the second trimester delivery with the laboratory classes previously consisting of laboratory skills and safety training week, which was then followed by three assessed laboratory classes with reports or worksheets. The consolidated version now consists of the virtual skills and safety training session then two virtual laboratory classes with assessed reports or worksheets. The laboratory classes will include 360-degree interactive tours and interactive videos where the laboratory setting has embedded experiments that student would explore the virtual space and collect the experimental data. Once the students collect their data from the virtual laboratory, they would then complete their laboratory reports or assessment items for that laboratory session. Initial feedback from these students on this virtual laboratory has been very positive.

CONCLUSION

In conclusion, the emergence of our 'new normal' learning and teaching model at Bond University will be heavily multi-modal.[11-15] The distance learning option and extra virtual support that has been implemented by the university will most likely stay as the students have been very positive about these extra options. We have had success with the sudden and forced move to online examinations, virtual laboratory classes and collaborative learning platforms proving that this multi-modal delivery is possible and maybe the preferred method moving forward. The feeling of being connected with the university and the clear expectations has been the key to the success of the online course sofar.

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